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GEOPHYSICAL INVESTIGATION OF MONITORING WELLS RICHARDSON FLATS TAILINGS SITE PARK CITY, SUMMIT COUNTY, UTAH

TDD #13-9211-001
6300-021-013-4006

PREPARED FOR:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region VIII
Waste Management Division
Mike Zimmerman, On-Scene Coordinator

PREPARED BY:

Samuel H. Baughman II
Geologist
Roy F. Weston, Inc.
Technical Assistance Team
Region III

November 30, 1992

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I. INTRODUCTION

On Wednesday October 21, 1992, Patricia Hawkins, United States Environmental Protection Agency (EPA) Region VIII Deputy Project Officer requested that members of the Roy F. Weston, Inc. Region III Technical Assistance Team (TAT) perform a geophysical investigation of three EPA installed monitoring wells at the Richardson Flats Tailings Site. This investigation was to be a zone cross over and the written request was dated November 2, 1992 by Patricia Hawkins. The geophysical investigation was to provide independent verification and analysis of the installation of the three monitoring wells.

II. SITE BACKGROUND

The Richardson Flats Tailings Site is located approximately three to five miles northeast of Park City in Summit County, Utah. The site covers approximately 160 acres of which there are more than 70 acres of mine tailings and approximately 20 acres for a municipal landfill. Adjacent to this area is a municipal land fill that is also bounded by Silver Creek to the west and a county road to the south (see Figure 1).

In June of 1992, Region VIII TAT designed and installed three groundwater monitoring wells on the north, south, and east sides of the landfill to determine the possible presence and horizontal extent of any organic or inorganic contaminants in the soil beneath the landfill.

Subsequently, United Park City Mines Co. (UPCMC), the potentially responsible party (PRP), did not agree with the locations or the designs of the three monitoring wells. It is believed by UPCMC that drilling through a landfill is not an EPA approved method of obtaining subsurface information. They also believe that the bentonite seals in the monitoring wells, particularly RF-MW-02, were placed incorrectly above the clay layer. If this were true the wells would act as a conduit allowing water to migrate upwards along the sand filled annular space between the casing and the hole into the unconsolidated layer above.

III. ACTIONS TAKEN

BPB Instruments, Inc. was contracted by Region III TAT to conduct the geophysical investigation which will consist of natural gamma and gamma gamma density probes. The natural gamma probe measures the naturally occurring potassium ions found in the soil. The gamma gamma density probe has a radioactive source that emits gamma particles and the probe measures the particles that are reflected back from the formation of soil or rock.

On November 10 and 11, 1992 the geophysical investigation was conducted at the site by BPB Instruments, Inc. with EPA Region VIII

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and Region III TAT supervision. Representatives from UPCMC were also present during the investigation. Region VIII TAT was on site conducting water sampling of the wells prior to the geophysical investigation and was not part of the operation.

All data were recorded on computer disc and hard copy graphs were produced in the field for preliminary analysis. A comparison of the geophysical logs, drilling, and well design logs will be made as part of this analysis.

IV. RESULTS

A. Well Locations

The three monitoring wells installed by Region VIII TAT are located around the eastern portion of the municipal landfill that is bisected by Interstate 40. RF-MW-01 is located to the south and is up gradient, while RF-MW-02 and RF-MW-03 are to north and are down gradient (See Figure 1).

B. Drilling Logs

Three monitoring wells,with diameters of four inches, were drilled with an air rotary drill rig and interval sampling of the soil was done with a split spoon every five feet. This method of sampling does not reveal the maximum information of the subsurface conditions as does continuous sampling, but is adequate when relatively thick units encountered or when the subsurface conditions are known.

Two different soil horizons were encountered at each well location; one of unconsolidated material and one of clay. The unconsolidated horizon may be subdivided into two sub-horizons; soil and soil with refuse. This upper unconsolidated horizon varies in thickness from the surface to depth of five to ten feet, also the top of the clay (See Figure 2).

The unconsolidated material of soil and refuse is more permeable than clay, thus allowing water to move, both horizontally and vertically, at a relatively fast rate. This horizon does not act as a confining layer for the clay below.

The clay horizon is of indeterminate thickness because drilling activities did not penetrate the bottom. The thickness of clay encountered varies from 12 to 24 feet (See Figure 2).

This clay is an aquatard, it retards or greatly slows the movement of water through it. Movement of water in an aquatard is primarily vertical due to gravity. Relatively large amounts of water may be contained in an aquatard, possibly 40-60 percent. This is because water takes such a long time to pass through the clay. Water will not move upward under hydraulic pressure, artesian flow, unless the aquatard is penetrated to the aquifer below. An aquifer is under pressure and will cause water to move

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upward in a hole through artesian flow. This aquatard, clay horizon, is acting as a confining layer to aquifers below.

Groundwater levels after installation of the monitoring wells varied between 7.8 and 26.3 feet below the ground surface, which is also below the top of the clay. Region VIII TAT conducted water sampling during the geophysical survey and measured water levels below ground surface were between 9.8 and 28.1 feet (See Table 1).

C. Well Design

Upon completion of drilling activities, monitoring wells were installed, which consisted of two inch PVC casing and screen with a bottom cap, a sand pack, a bentonite seal or plug, a bentonite and cement grout, and a well cap with lock. The screen has a slot size of 0.010 and the sand pack consists of 10-20 mesh Colorado Silica Sand. In RF-MW-01 and RF-MW-03 there is 15 feet of screen at the bottom and in RF-MW-02 there is only 10 feet. Sand packs were placed from the bottom of the hole up to two to four feet above the top of the screen, in the annular space between the PVC casing and the side of the hole. Above the sand packs, a bentonite plug was placed. This plug measures two feet thick in RF-MW-01 and RF-MW-03, while in RF-MW-02 this plug is 3.5 feet thick (See Table 1).

D. Geophysical Logging.

Because interval sampling was performed, it is difficult to be certain where various soil horizons begin and end. For this reason, the geophysical data should be relied upon more.

The geophysical logging more accurately confirmed the depth to the top of the clay horizon. It also helped to corroborate the placement of the sand packs and the bentonite plugs in each of the monitoring wells. In all of the wells, the bentonite plug is at or below the top of the clay horizon. This placement will not permit water to migrate upwards through the sand pack into the horizon above (See Table 1).

V. CONCLUSIONS

Analysis of the drill logs indicate that a clay horizon of unknown thickness is overlain by an unconsolidated material. This overburden is relatively thin, approximately 5.5 feet thick, in RF-MW-01 and is composed of topsoil and silty clay. In RF-MW-02 AND RF-MW-03, this overburden is somewhat thicker, 9 and 26 feet respectively, and consists primarily of refuse from the landfill which is in turn covered by a thin cap layer of top soil.

All groundwater level readings demonstrate that levels do not rise above the top of the clay horizon. This indicates no upward migration of water through the sand packs. If there were, the water would be stopped by the bentonite plug above the sand pack around the outside PVC casing. All screened areas are also below

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the top of the clay horizon, therefore no cross contamination may occur through the screen.

The groundwater system is not isolated from the landfill because the groundwater must pass through the landfill as it moves downward. When the groundwater reaches the aquatard it begins to move more laterally downslope along the top of the clay surface. This aquatard is not totally impermeable so water will migrate through it, as stated earlier. The rate of water movement will be greater along the top of the clay rather than downward through it.

VI SUMMARY

In view of all data; drill, well installation, and geophysical logs; the monitoring wells at this site have been installed and located in a correct manner with EPA guidelines. Drilling within a landfill and into a clay horizon is not prohibited. There are many examples of this at CERCLA sites involving municipal or solid waste landfills.

The RCRA Technical Enforcement for Installation of Monitoring Wells, OSWR 9950.1, recommends that a minimum of four monitoring wells be installed around a hazardous waste unit, one up gradient and three down gradient for detection purposes. A possible future action may be to install a fourth well at this site. If this is found necessary, then it is recommended that this well be placed between RF-MW-01 and RF-MW-02, with a screened area above the clay horizon to monitor water that will penetrate the landfill but not the clay. This water has the potential to discharge into Silver Creek and also into the swamp to the north.

The publication Conducting Remedial Investigation/Feasibility Study of CERCLA Municipal Landfill Sites, EPA/540/P-91/011, OSWR Directive 9355.3-11, states that care should be taken for the placement and drilling of monitoring wells through a landfill. Drilling through the bottom of a landfill is not recommended, but is not prohibited, care must be taken to properly seal the hole so as to stop leachate from migrating to the lower aquifers.

The EPA gives CERCLA's Removal Section the authority to waive all permits that may be required by local, state, and federal government agencies to accomplish the mitigation of a possibility and imminent threat to the public and the environment at a particular site.

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TABLE 1

Well Logging & Design*

Well	Top of Clay	Bentonite Plug Top	Bentonite Plug Bottom	Screening Depths	Bottom Depths
(RF)					
MW-1	5.0'	4.0'	6.0'	10.0-25.0'	25.0'
MW-2	25.5'	22.5'	26.0'	28.0-38.0'	39.0'
MW-3	10.0'	13.0'	16.0'	19.0-34.0'	35.0'

Well	Depths of Soil & Refuse
(RF)	
MW-1	---------
MW-2	5.0-25.5'
MW-3	4.0- 9.0'

Geophysical Interpretation*

Well	Top of Clay	Bentonite Plug Top	Bentonite Plug Bottom	Top of Sand Pack
(RF)				
MW-1	5.5'	5.5'	10.0'	10.0'
MW-2	26.0'	23.0'	26.0'	26.0'
MW-3	9.0'	13.5'	16.0'	16.0'

[illegible]

Groundwater Level Readings*

Well	6/92	11/10/92	1/11/92 **
(RF)			
MW-1	7.8'	9.84'	8.0'
MW-2	26.3'	28.13'	28.0'
MW-3	21.3'	22.26'	23.0'

Notes: ** All measurements from surface to depth.
*Measured with gamma probe 24 hours after wells were purged for sampling.

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